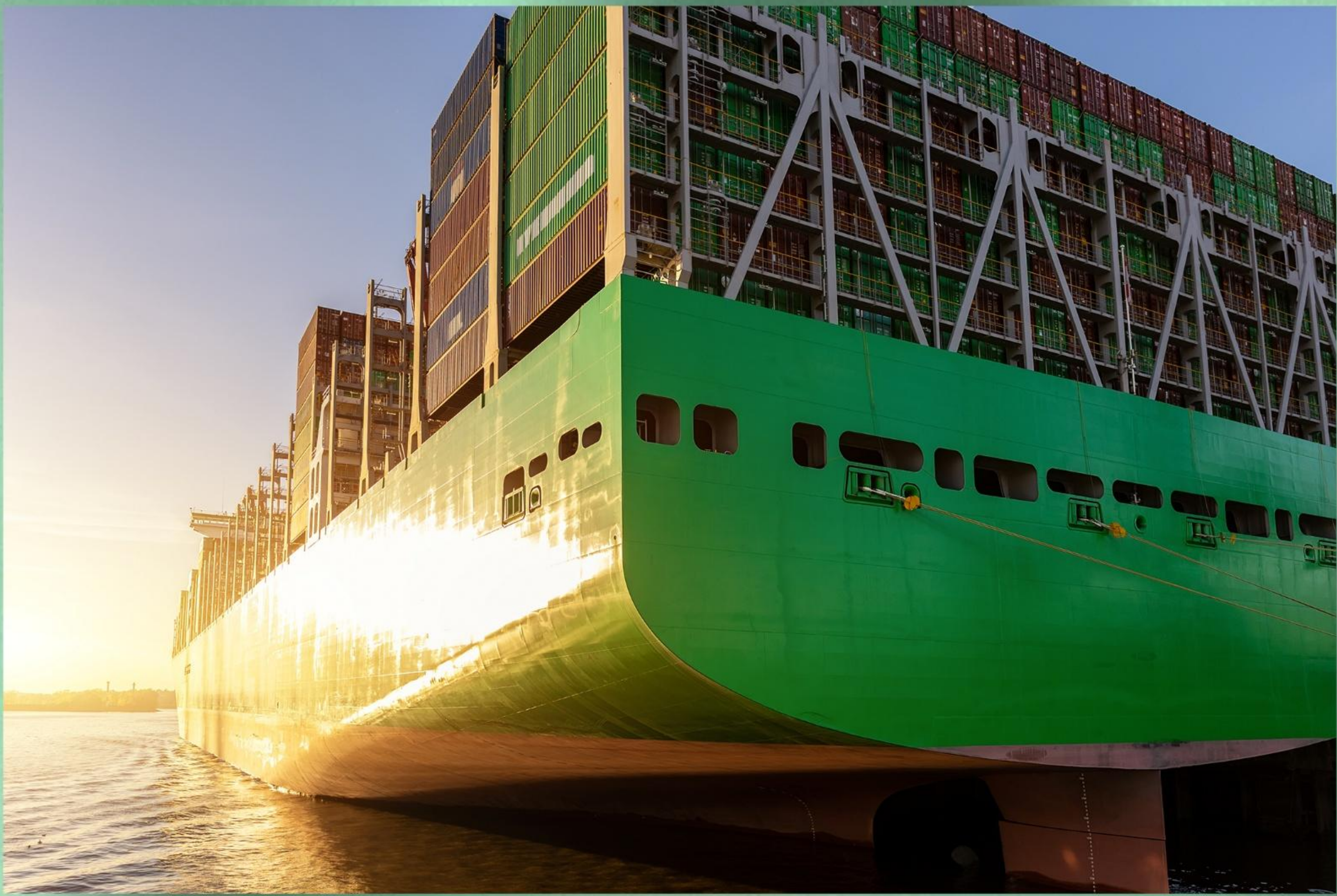
World Shipping Council



WSC EU Shipping Decarbonisation Report:

# Can the EU fuel shipping's decarbonisation?

2025

## About World Shipping Council

The World Shipping Council is the united voice of liner shipping, working with policymakers and industry groups to shape the future growth of a socially responsible, environmentally sustainable, safe, and secure shipping industry. We are a non-profit trade association with offices in Brussels, London, Singapore and Washington, D.C.

80% of everything we buy has come by ship. World Shipping Council members are the international container and vehicle carriers that make global trade possible by offering cost efficient and effective transport for everything from raw materials, food and machinery parts to consumer essentials like medication, clothes and electronics.

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# Executive summary

As one of the world's largest exporters, the European Union relies on shipping to maintain its economic strength and global influence.

Today, shipping contributes approximately 3-4% of the EU's total greenhouse gas (GHG) emissions. While it remains one of the most carbon-efficient transport modes, achieving significant emissions reductions is essential for meeting EU climate targets.

The EU has established a legally binding objective of net-zero emissions by 2050 across sectors, with a goal under FuelEU Maritime to reduce regional EU shipping's GHG emissions by 80%. The EU is also negotiating an IMO Net Zero Framework for international shipping to globally decarbonise by 2050. Reaching both regional and global milestones requires a large-scale transition from conventional fossil fuels to renewable alternatives, supported by targeted regulations, fleet readiness, and new production of renewable marine fuels.

**The global fleet is transforming for decarbonisation**
The transition to renewable fuels necessitates vessels designed or retrofitted to operate on alternative energy sources. Currently, 689 new liner vessels—containerships and vehicle carriers—are on order for delivery by 2030, in addition to 160-200 already in operation. The vessels on order represent 69% of the existing liner sector order book by vessel count and 79% by deadweight tonnes (DWT).

Following the progress of liner shipping, the broader global fleet is at earlier stages of investment and slower adoption rates of renewable-capable vessels, with 8% of to the order book for non-liner vessels currently specifying designs for renewable marine fuels.

**Demand for alternative fuels in the EU is already visible**
The rise of alternative fuel vessels in the EU is evident in fuel consumption trends. LNG use by vessels other than LNG Carriers has grown by 265% since 2018, and LNG use by these vessels now accounts for 1.78% of EU total maritime fuel consumption. These vessels can transition to bio- or e-methane as supply scales. Methanol adoption remains low at 0.02%, but with more methanol-capable vessels on order, demand is expected to increase.

**Projected fuel demand predicted to grow as new vessels become operational**
By 2030, global vessels currently on order are expected to require:

- 14.4 million tonnes oil equivalent (Mtoe) of methane
- 7 Mtoe of methanol
- 0.7 Mtoe of ammonia

Ensuring a sufficient supply of renewable fuels is critical to supporting the transition, yet current production capacity for 2030 remains uncertain.

**Opportunities for the EU to supply future renewable fuels demand**
There are clear signs production is increasing within the EU to supply renewable fuels. Europe currently supplies 20% of the world's marine fuels and must significantly expand renewable fuel production to maintain this share in a decarbonised shipping sector. However, the current price gap between renewable fuels and conventional fuels, alongside competing demands by other sectors will impact the utilisation of that supply by the shipping industry.

**Global renewable fuel supply might meet 2030 demand**
Some projections suggest that by 2030, global supply of renewable marine fuel could match projected shipping uptake capacity. However, the cost gap between fossil and renewable fuels remains a major barrier to production and commercial uptake of renewable marine fuels. Without effective regulations, the high price of renewable marine fuels limit and/or delay production.

**Cost barrier will slow uptake and prevent achieving 2030 targets in FuelEU and at IMO**
The significant cost disparity between renewable and fossil fuels presents a major obstacle:

- Bio-methane is 169% more expensive than fossil LNG
- Bio-methanol is 469% more expensive than Very Low Sulphur Fuel Oil (VLSFO)
- E-methane and e-methanol are projected to be 560% and 626% more expensive than their fossil equivalents

Without targeted regulatory and financial mechanisms to bridge this gap, market uptake of renewable fuels will remain slow, delaying decarbonisation goals.

**EU regulation is supporting regional transition**
For renewable fuels to be commercially viable, strong regulatory frameworks must incentivise investment and adoption. Ahead of a global regulation, the EU implemented regional policies:

- FuelEU Maritime – setting targets for reducing GHG intensity in marine fuels.
- The Emissions Trading System (EU ETS) – introducing carbon pricing for shipping.
- The Alternative Fuels Infrastructure Regulation (AFIR) – promoting investments in refuelling infrastructure for low-carbon fuels.

These policies are designed to drive investment in cleaner shipping fuels and encourage widespread adoption.

**Effective regulations are necessary to achieve the 2030 targets, and beyond**
As global regulations are designed within the International Maritime Organisation (IMO), the EU should align regional policies to prevent market distortions.

EU Member States along with IMO delegations recognise that a GHG pricing mechanism is necessary to decarbonise shipping. Effective regulation should bridge the price gap between conventional fossil fuels and renewable alternatives to ensure the renewable markets is scaled and commercially viable.

This report recommends that the EU take regulatory action to:

1. Align regional policies with global regulations;
2. Apply the Well-to-Wake principle to ensure that renewable fuels are rewarded;
3. Develop cost for difference mechanisms to catalyse renewable marine fuel uptake;
4. Implement fuel certification systems that ensure global supply of truly renewable marine fuels.

**World Shipping Council is committed to decarbonising**
The World Shipping Council members are committed to decarbonisation and supportive of a global greenhouse gas regulation, specifically an economic measure to bridge the cost gap between fossil fuels and green fuels is essential to achieving our net-zero goal by 2050.

# Introduction

**Importance of ocean shipping to the European Union**

As one of the world's largest exporters, the European Union relies on shipping to maintain its economic strength and global influence. With EU trade carried by liner shipping worth €2.5 trillion each year, the movement of goods by sea is essential to Europe's economy. In fact, 90% of goods by volume enter and leave the EU by sea. Liner shipping makes more than 65,000 port calls to some 130 EU ports every year. These vessels connect Europe to over 900 ports worldwide, reaching key markets and building important international relationships.

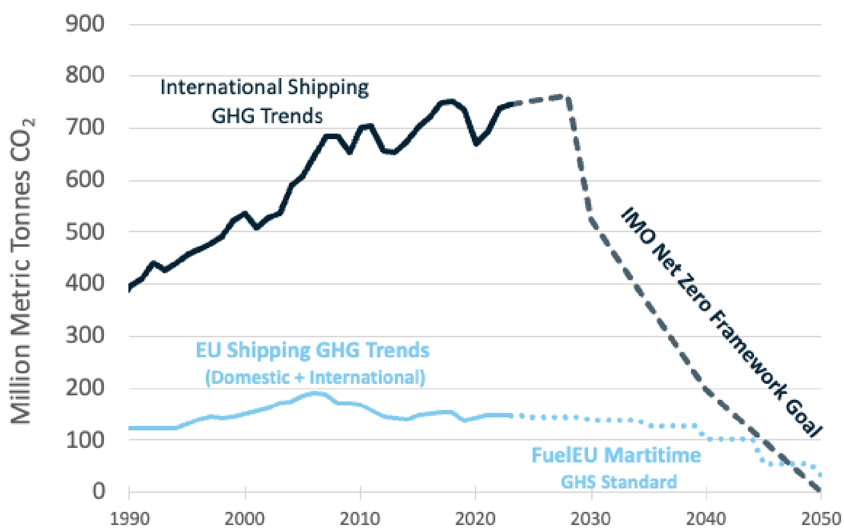
Strong two-way trade keeps Europe competitive. While exports drive growth, imports provide vital supplies and components for European manufacturers and consumers. Secure shipping links give the EU competitive access to global markets and essential supplies.

**Shipping's emissions profile**

Maritime transport contributes approximately 3-4% of the EU's total greenhouse gas (GHG) emissions. Despite being one of the most carbon-efficient transport modes compared to aviation and road freight, shipping's environmental impact remains significant. With global trade volumes, and EU-specific shipping demand, expected to rise, decarbonising the sector is critical. Figure 1 presents shipping GHG trends since 1990 and policies to decarbonise by 2050.

The industry has set a global target of net-zero emissions by 2050, but its heavy reliance on fossil fuels poses a major challenge. Transitioning to sustainable alternatives will be essential to meeting climate goals while maintaining efficient global trade.

**Figure 1. Shipping GHG trends and decarbonisation goals**[1]



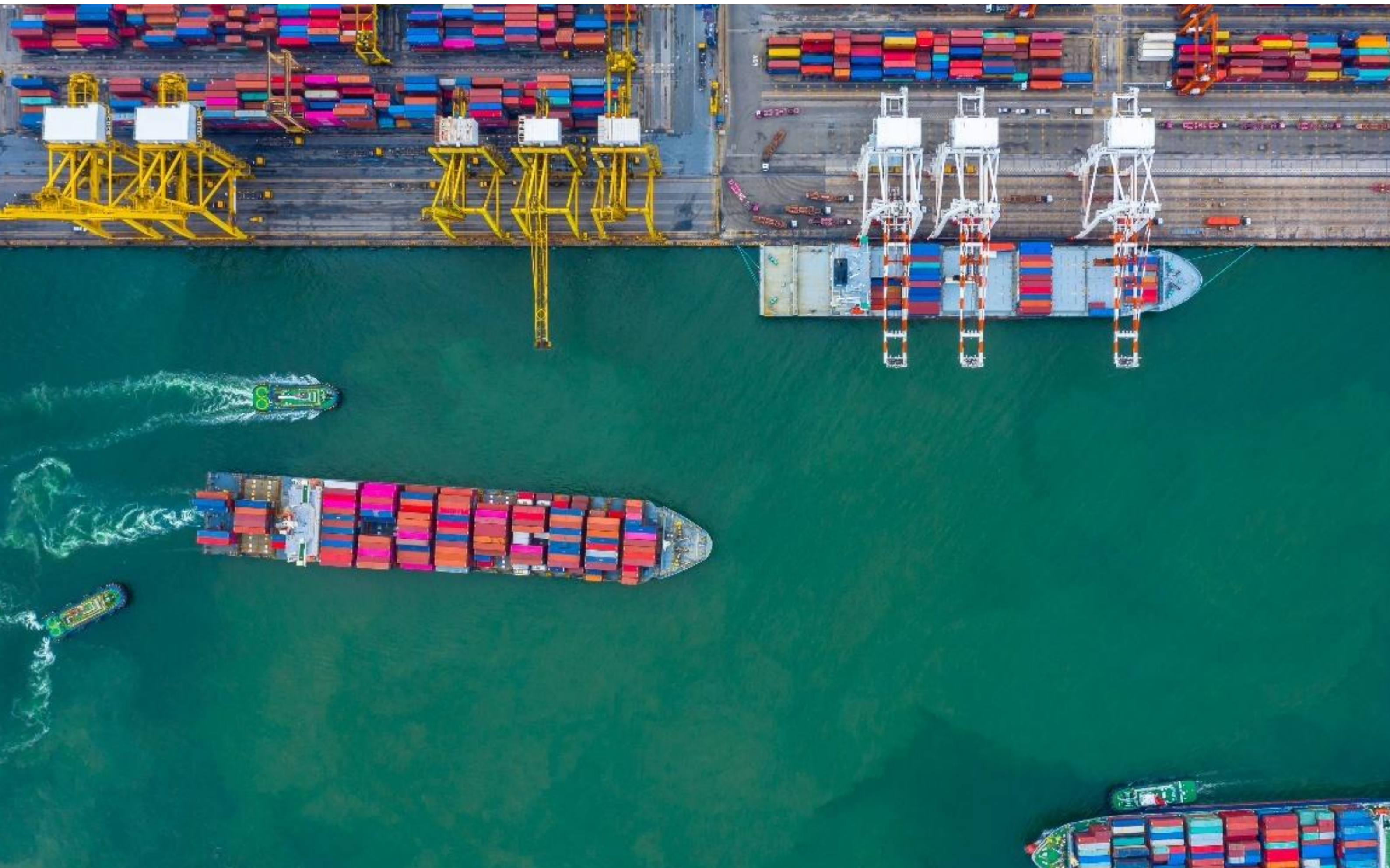

[1] Sources: Global trend data from EDGAR - Emissions Database for Global Atmospheric Research, Crippa, M., Guizzardi, et al, GHG emissions of all world countries, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/4002897, JRC138862; Europe trend data from Eurostat Greenhouse gas emissions by source sector, updated April 2024, accessed March 2025. Policy projections from EU FuelEU Maritime and IMO Net Zero Framework.

EU targets for shipping emissions reduction

The EU has set a net-zero target for 2050 for all sectors, aligning with its legally binding commitment to achieve climate neutrality under the European Green Deal. Through FuelEU Maritime, the EU set an 80% reduction target for the shipping sector. To decarbonise shipping, several key regulatory frameworks have been introduced:

- Fit for 55: A comprehensive policy package aiming to reduce GHG emissions by 55% by 2030 compared to 1990 levels, impacting the maritime sector through fuel regulations and energy efficiency mandates.
- Emissions Trading System (ETS): From 2024, shipping emissions are gradually being integrated into the EU ETS, requiring vessel operators to purchase carbon allowances, incentivising emission reductions.
- FuelEU Maritime: Effective from 2025, this regulation enforces a progressive reduction in GHG intensity from fuels used by vessels. FuelEU requires stepwise GHG reductions every five years, e.g., 2025, 2030, progressing to an 80% reduction in GHG-intensity by 2050.
- Alternative Fuels Infrastructure Regulation (AFIR)**:** Core EU ports must upgrade onshore power supply, expand alternative fuel bunkering, and improve infrastructure to support low-emission shipping. These measures aim to modernise port operations and facilitate the transition to greener maritime transport.

These initiatives align with broader International Maritime Organisation (IMO) goals to reduce shipping emissions globally. This year, the IMO plans to reach agreement on a comprehensive global measure to decarbonise shipping.



# A new fleet to run on renewable fuel

Shipping is undergoing a major technological transformation as the industry seeks to decarbonise and reduce its environmental impact.

While traditional vessels have relied on fossil fuels, decarbonisation requires vessels with dual-fuel engine systems capable of using renewable fuels. New vessels or significant modifications (retrofits) to existing vessels are needed due to the specific energy density, storage, and combustion requirements of alternative fuels.

To bridge the gap between today's fossil-fuel-reliant fleet and a zero-near zero-emission future, new fuel and engine technologies are being developed. Nearly 700 liner vessels (containerships and vehicle carriers) currently on order are designed as dual-fuel vessels, meaning they can operate on conventional fossil fuels while also being equipped to transition to cleaner alternatives when they become commercially viable. These vessels will be delivered before 2030, increasing the fleet technical readiness for renewable fuel uptake.

**Ordering new vessels**

The green transition will require the replacement of conventional vessels. As of today, between 160 and 200 liner vessels (containerships and vehicle carriers) are already on the water with dual-fuel or alternative fuel capabilities.

A much larger shift is also underway, with an additional 689 new liner vessels (containerships and vehicle carriers) currently on order for delivery by 2030, representing 69% of the existing order book by vessel count or 79% by Deadweight Tonnes (DWT).

**Table 1: Renewable-capable vessel order book**[2]

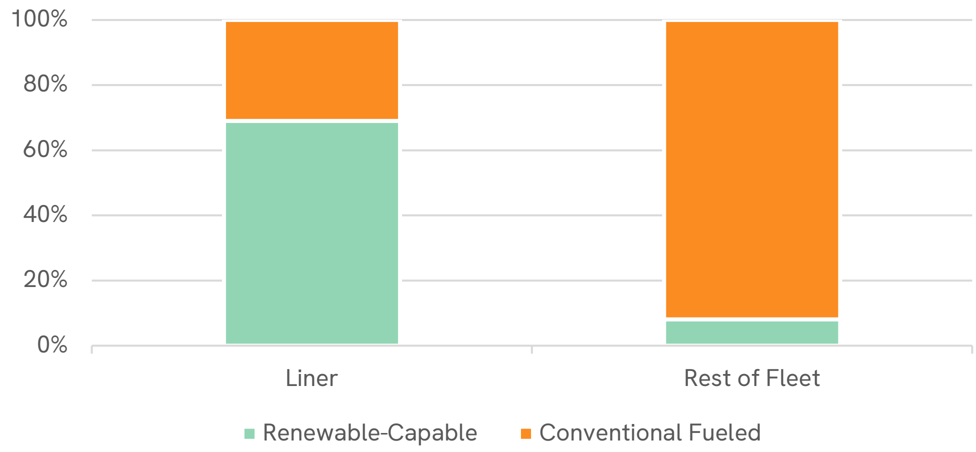
| Vessel Type | Metric | Renewable fuel capable | Percentage of fleet | All fleet |
|---|---|---|---|---|
| Containership | Vessels | 507 | 65% | 780 |
| | DWTs (millions) | 73.8 | 73% | 93.4 |
| | TEUs (millions) | 6.78 | 79% | 8.58 |
| | | | | |
| Vehicle Carrier | Vessels | 182 | 83% | 219 |
| | DWTs (millions) | 3.32 | 85% | 3.9 |
| | | | | |
| Rest of Fleet | Vessels | 396 | 8% | 4887 |
| | DWTs (millions) | 34.89 | 13% | 277 |

*Note: A deadweight tonne (DWT) is a measurement of how much weight a vessel can carry, including cargo, fuel, crew, passengers, and supplies. Unlike gross tonnage, which measures a vessel's size, DWT focuses on cargo carrying capacity. This metric is important for shipping efficiency, and fuel consumption.*

Liner shipping companies are leading with twice the investment in renewable cargo capacity compared to all other vessel types combined. Figure 2 shows the percent of renewable-capable capacity in liner shipping and rest of fleet. Renewable-fuel investment supports vessel design innovation and drives demand for alternative fuels and supporting port infrastructure.

[2] *Data from Alphaliner Monthly Monitor, January 2025.*

**Figure 2. Percent of fleet order book by renewable and conventional fuels[3]**




**Different fuels for different vessels**

One renewable fuel is not like the other, and advanced renewable fuels need new vessels to be designed for each specific fuel type. And each fuel offers different risk-benefit factors related to safety, cost, air pollutants, and GHG emissions. The main alternative fuel types for which new vessels are being built currently include:

- Methane – Fossil methane is natural gas used by vessels under liquified and refrigerated conditions under pressure. Liquefied fossil methane (LNG) emissions of GHGs, measured in $CO_2$-equivalent emissions across the fuel lifecycle, reduce GHGs by about 20% compared to conventional marine fuels. Vessels operating on LNG are able to switch to bio and e-Methane that can provide deep GHG reductions when produced from renewable feedstocks and electricity.

- Methanol – An alternative fuel that can be produced from fossil refining, biofeedstock, or through electrolysis processes. Fossil methanol is a refined petrochemical energy product that does not reduce GHGs, but bio and e-Methanol processes can provide deep GHG reductions when produced from renewable feedstocks and electricity.

- Ammonia – An alternative fuel that can be produced from fossil refining, biofeedstock, or through electrolysis processes. Ammonia can be used as a fuel by vessels when liquified and refrigerated under pressure. Ammonia contains no carbon molecules and therefore ammonia combustion produces no CO2 or methane GHGs. Emissions of N2O, one of the long-lived GHGs, and other NOx pollutants, may require emissions abatement. Vessels operating on ammonia from renewable electrolysis can achieve deep GHG reductions when produced from renewable feedstocks and electricity.

While the industry explores multiple pathways, WSC remains fuel agnostic, advocating for policies that allow the market to determine alternative fuels based on availability, cost, and scalability. Table 2 and Table 3 summarise containerships existing and on order according to the

[3] *Data from Alphaliner Monthly Monitor, January 2025.*

fuels they can use currently and when delivered. Figure 3 shows increasing investment in TEU capacity since 2020 in renewable-capable vessels.

**Table 2: Containership fleet fuel type by vessel**[4]

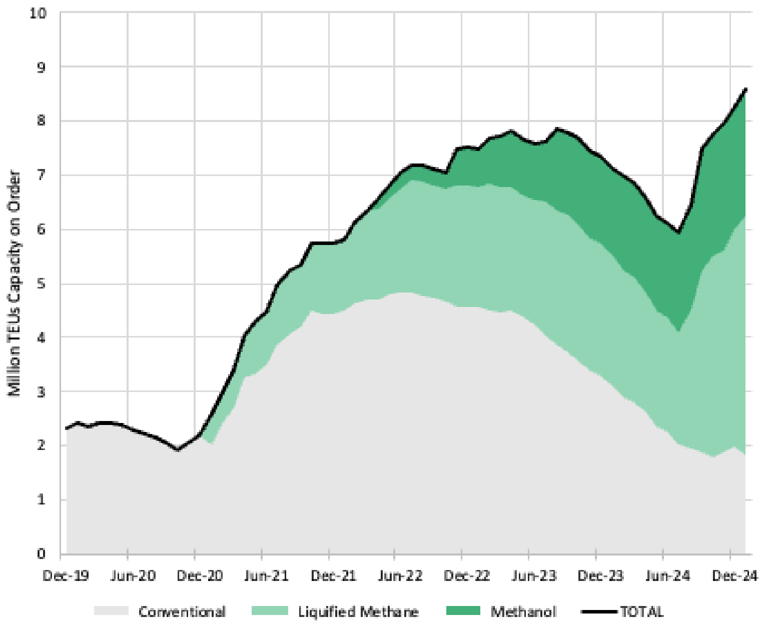
| | Existing | Order book | Total by 2030 |
|---|---|---|---|
| Conventional | 6,233 | 273 | 6,506 |
| Methanol | 16 | 196 | 212 |
| Liquified Methane | 149 | 311 | 460 |
| TOTAL | 6,398 | 780 | 7,178 |

**Table 3: Containership fleet fuel type by TEU capacity**[5]

| | Existing | Order book | TEU Total by 2030 |
|---|---|---|---|
| Conventional | 29,106,035 | 1,802,927 | 30,908,962 |
| Methanol | 142,160 | 2,327,062 | 2,469,222 |
| Liquified Methane | 1,782,468 | 4,453,584 | 6,236,052 |
| TOTAL | 31,030,663 | 8,583,573 | 39,614,236 |

*NB: Only containerships are represented as up-to-date data is not available on other vessel types currently in service.*

**Figure 3. Containership TEU capacity on order**[6]




*Note: To assess alternative fuels' impact on shipping, it's crucial to consider both the number of capable vessels and their cargo capacity. Twenty-foot equivalent units (TEUs) measure how many standard containers a vessel can transport, providing a clearer picture of emissions reduction potential at scale.*

Full decarbonisation remains a long-term challenge, as there are still 6000 conventionally fuelled containerships in operation. However, the renewable vessels added to the current fleet by 2030 will mean that more than 22% of global in-service capacity will be renewable-fuel

[4] *Data from Alphaliner Monthly Monitor, January 2025.*
[5] *Data from Alphaliner Monthly Monitor, January 2025.*
[6] *Data from Alphaliner Monthly Monitor, January 2025.*

capable. The pace of transition will be even faster as the legacy fleet of conventional fuelled ships are recycled and renewable-capable ships serve more global routes.

### Vessels calling on Europe are using more alternative fuels

We are already seeing an increase of renewable-capable vessels calling at EU ports, even ahead of the continuous investment indicated in the order book.

EU MRV shows that in 2023, methane (currently LNG) fuel use was 1.78% of total EU maritime fuel consumption, when excluding LNG Carriers. While this figure remains low compared to conventional maritime fuels, vessels able to operate on methane have increased by 265% since 2018, or by 324% as a share of total EU maritime fuel consumption. Methanol is currently only emerging in fleet renewable fuel consumption, with a lower representation of 0.02% in 2023. While these vessels are largely using fossil fuels currently, they have the capability to use renewable alternatives.

The overall growth in alternative fuel demand gives an indication of the current fleet calling in the EU with the ability to transition to renewable marine fuel as they become viable.

**Table 4: Total EU maritime fuel demand**[7]

| Fuel | Million Tonnes Oil Equivalent (Mtoe) | Percent of total[1] |
|---|---|---|
| Heavy fuel oil | 22.67 | 55.30% |
| Light fuel oil | 6.40 | 15.60% |
| Gas oil | 5.66 | 13.80% |
| Diesel oil | 2.58 | 6.30% |
| Methane (currently LNG) | 3.32 | 8.10% |
| Other fuels (non-specified) | 0.29 | 0.70% |
| LPG | 0.04 | 0.10% |
| Methanol | 0.01 | 0.02% |

*Note: Percents don't exactly add to 100% due to rounding in EU MRV reporting.*

**Table 5: Summary of LNG use in EU MRV**[8]

| Year | LNG total (Mtoe) | LNG Carrier (Mtoe) | Other vessels (Mtoe) |
|---|---|---|---|
| 2018 | 1.66 | 1.46 | 0.20 |
| 2019 | 2.14 | 1.78 | 0.36 |
| 2020 | 2.59 | 2.20 | 0.39 |
| 2021 | 2.28 | 1.83 | 0.46 |
| 2022 | 3.02 | 2.63 | 0.39 |
| 2023 | 3.32 | 2.59 | 0.73 |

*Note: An LNG (Liquefied Natural Gas) Carrier is a specialised vessel designed for transporting liquefied natural gas. We exclude these as these vessel systems manage the cargo boil-off gas, which is natural gas that evaporates during transit, directing this energy for use as fuel for the vessel's engines, rather than dual-fuel vessels.*

[7] Data from 2024 Report from the European Commission on CO 2 Emissions from Maritime Transport, Full Report, SWD(2025) 38 final, European Commission, December 2024, Section 2.4, page 28.
[8] Data from 2024 Report from the European Commission on CO 2 Emissions from Maritime Transport, Full Report, SWD(2025) 38 final, European Commission, December 2024, Figure 15, page 29.

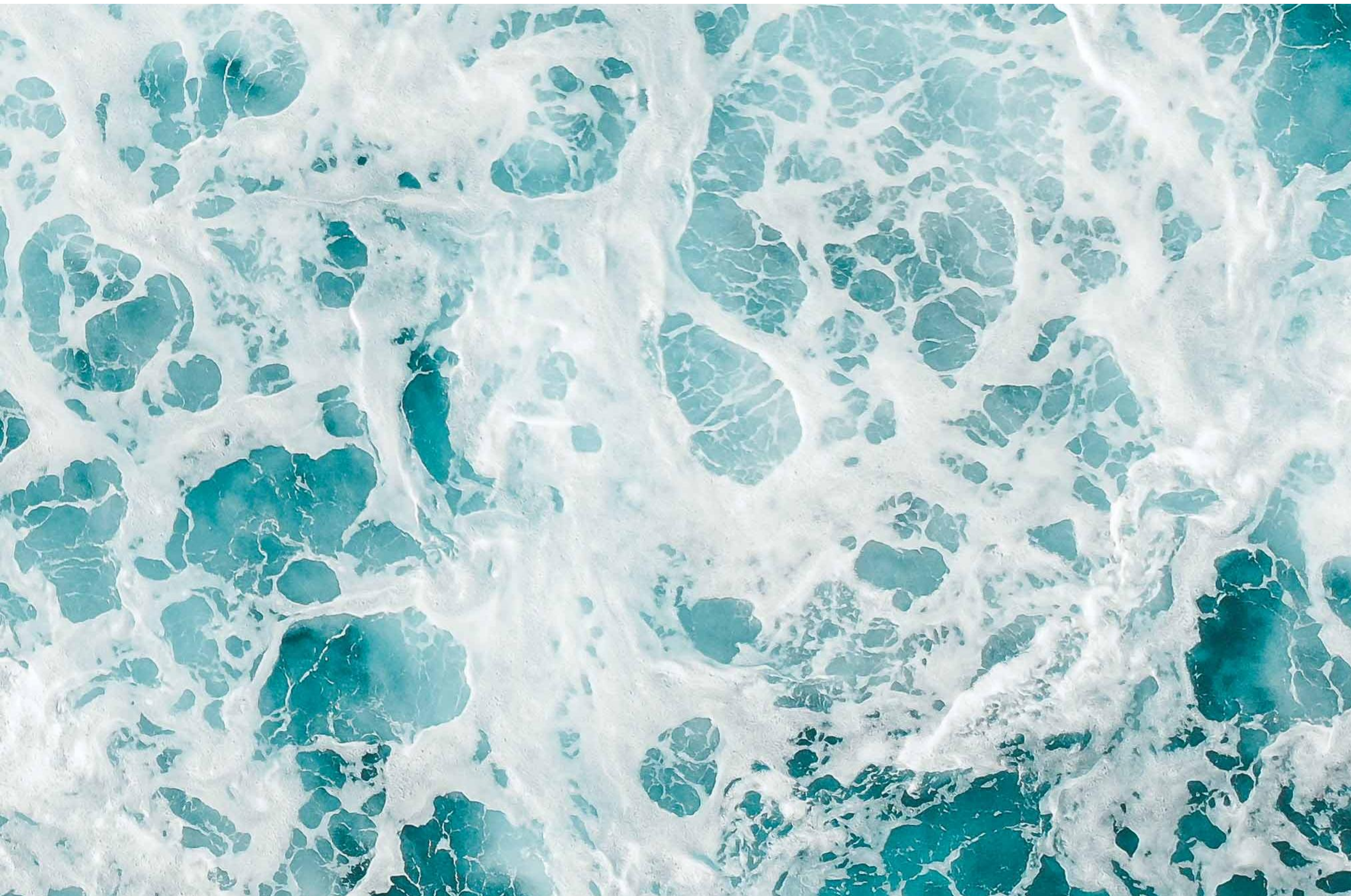
Using fleet DWT and fuel consumption data reported in the Fourth IMO GHG Study, and applying first-order proportionality between DWT and fuel use, WSC estimated the potential fuel consumption of the renewable-capable fleet in the order book. Table 6 reports these fuel estimates, in million tonnes oil equivalent (Mtoe) for methane, methanol, and ammonia. These estimates compare well with other assessments of demand for these fuels by energy producers and technical organisations.

**Table 6: Projected fuel demand from vessels on order**

| Vessel Group | Methane (Mtoe) | Methanol (Mtoe) | Ammonia (Mtoe) |
|---|---|---|---|
| Containerships | 11.7 | 5.8 | 0.0 |
| Vehicle Carriers | 1.3 | 0.3 | 0.0 |
| **Liner Fleet** | **13.0** | **6.1** | **0.0** |
| Rest of Fleet | 1.4 | 0.9 | 0.7 |
| **Total** | **14.4** | **7.0** | **0.7** |

With nearly 700 liner vessels, and 396 other vessels on order capable of running on renewable fuels, these new vessels will demand 14.4 million tonnes oil equivalent (Mtoe) of methane, 7 Mtoe of methanol and 0.7 Mtoe of ammonia.

Nearly all these vessels on order will be in service by 2030. While fossil-fuel options may be available today, achieving decarbonisation will require adequate and commercially viable supply of renewable fuels.



# Fuel availability

The availability of green maritime fuels is critical to the shipping industry's transition to net zero by 2050. Scalable, commercially viable alternatives are essential to reducing emissions while maintaining global trade efficiency. The growth of new renewable-fuel capable vessels entering service will need to be met by sufficient supply of renewable fuels, else the industry risks falling short of decarbonisation targets.

**Current availability of renewable fuel in Europe is limited**

Today, availability of renewable maritime fuels in Europe remains limited. While numerous ambitious projects and pilot programs for renewable and low-carbon maritime fuels such as methanol, ammonia, and methane are underway, widespread commercial-scale production must scale up if it is to meet future demand.[9]

**Production of renewable fuel in Europe**

Europe currently supplies approximately 20% of the world's maritime fuels to the global fleet. To maintain its competitive position as a global maritime hub, Europe will need to scale up the production of renewable fuels to meet the demand from new vessels. This report has looked at a range of fuel types and the current or planned production of these fuels in Europe.

***Renewable methanol***

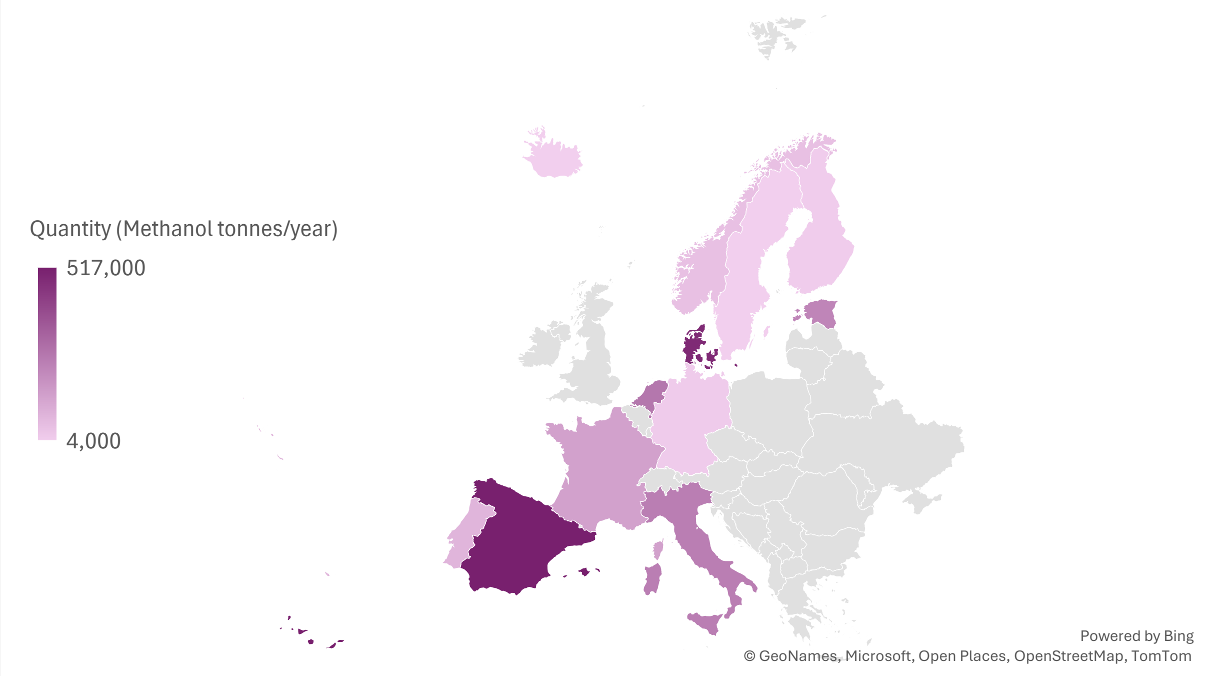
According to the DNV Alternative Fuel Outlook, Europe could supply approximately 2.24 million tonnes of renewable methanol[10] per year, equivalent to 1.06 million tonnes of oil (Mtoe) by 2030. See a map of these data in Figure 4. This estimate is conservative, as it only includes existing and approved methanol production facilities, excluding projects still under development.

By 2030, the global fleet is expected to require around 7 Mtoe of renewable methanol, with the liner sector alone accounting for 6.1 Mtoe (refer to Table 6). If this production comes online as planned, Europe could meet 22% of global demand for renewable methanol in shipping, if all the renewable methanol produced was allocated to the maritime sector. Given that the EU

[9] DNV Maritime Forecast to 2050 (August 2024), accessed on March 2025 at https://www.dnv.com/maritime/publications/maritime-forecast/
[10] DNV Alternative Fuel Outlook looks both at E-methanol and biomethanol production, accessed on March 2025 at https://afi.dnv.com/.

currently supplies approximately 20% of global conventional marine fuel, it has the potential to maintain its market share in the transition to sustainable maritime fuels.

**Figure 4: 2030 European Economic Area (EEA) potential bio and e-methanol production**[11]




***Renewable methane***

By 2030, the European Biogas Association projects that Europe will produce approximately 6.3 billion cubic meters (bcm) of biomethane annually; this is equivalent to 5.67 million tonnes of oil (Mtoe).[12] See Figure 5. However, how much of this output will be allocated to the transport sector remains unclear, and sufficient renewable transport fuels must be directed to meet maritime demand. In 2023, transport accounted for 23% of Europe's biomethane use.[13] Extrapolating these proportions to the 2030 forecast suggests that around 1.5 bcm (1.35 Mtoe) could be allocated to transport. If this entire allocation were dedicated to shipping, European biomethane would meet about 9.4% of the estimated 2030 global maritime methane demand of 14.4 Mtoe (as shown in Table 6).

In addition, Europe's e-methane production is expected to reach approximately 1,819.21 GWh per year by 2030, which corresponds to roughly 0.17 bcm or 0.16 Mtoe[14] (see Figure 6). This estimate is based on projects that list transport as a potential end use. However, the specific share designated for maritime applications remains uncertain. If Europe's entire e-methane output was allocated exclusively to shipping, which is highly unlikely, European e-methane production would cover about 0.11% of the projected global maritime methane demand in 2030.

[11] Data from DNV Alternative Fuel Outlook, accessed March 2025
[12] 2nd EBA Investment Outlook on Biomethane (June 2024)
[13] EBA 2023 Statistical Report Press Release (December 2024)
[14] Based on Annex 1 of the EBA paper on Mapping e-methane plants and technologies (September 2024)

Combined, the renewable methane supply, from both biomethane and e-methane, would meet only 10.5% of the global maritime methane demand projected for 2030.

**Figure 5: 2030 EEA potential biomethane Production**[15]

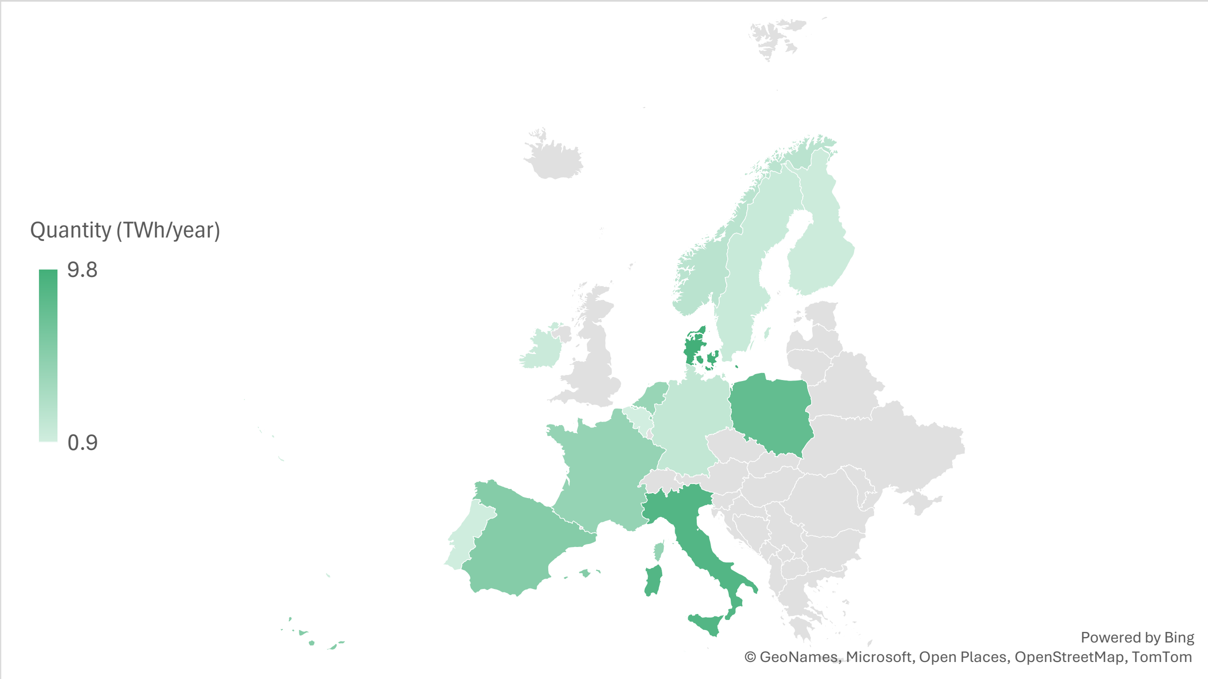
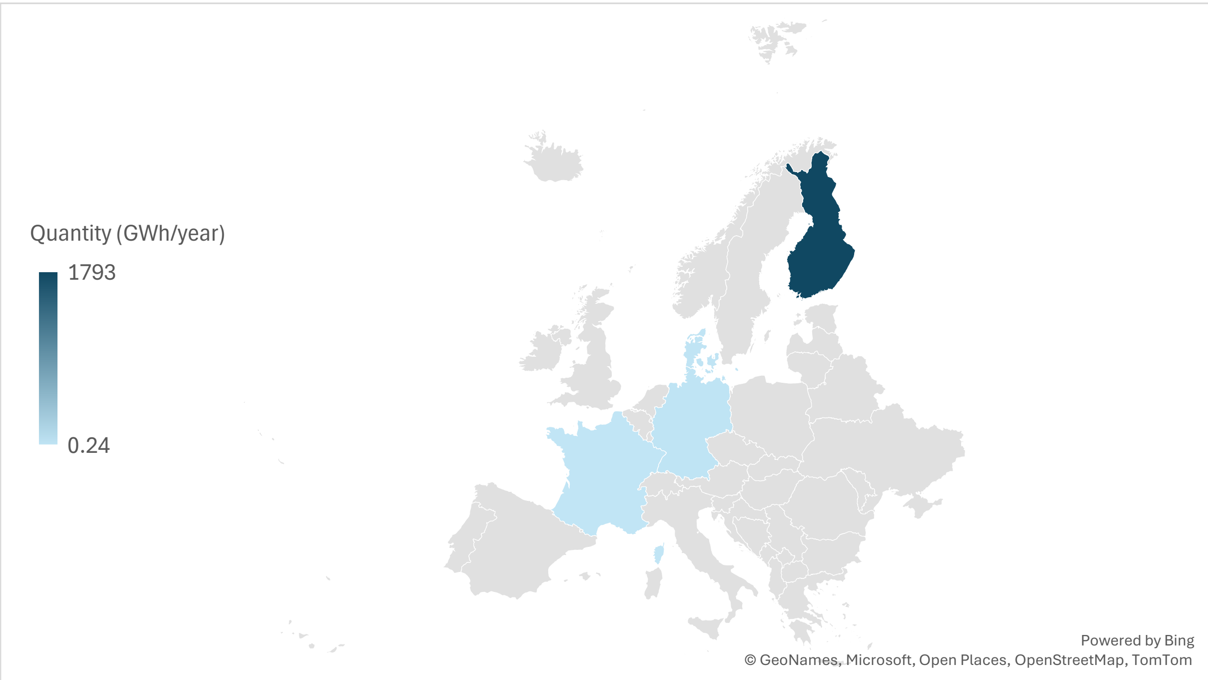



**Figure 6: 2030 EEA potential e-methane production**[16]



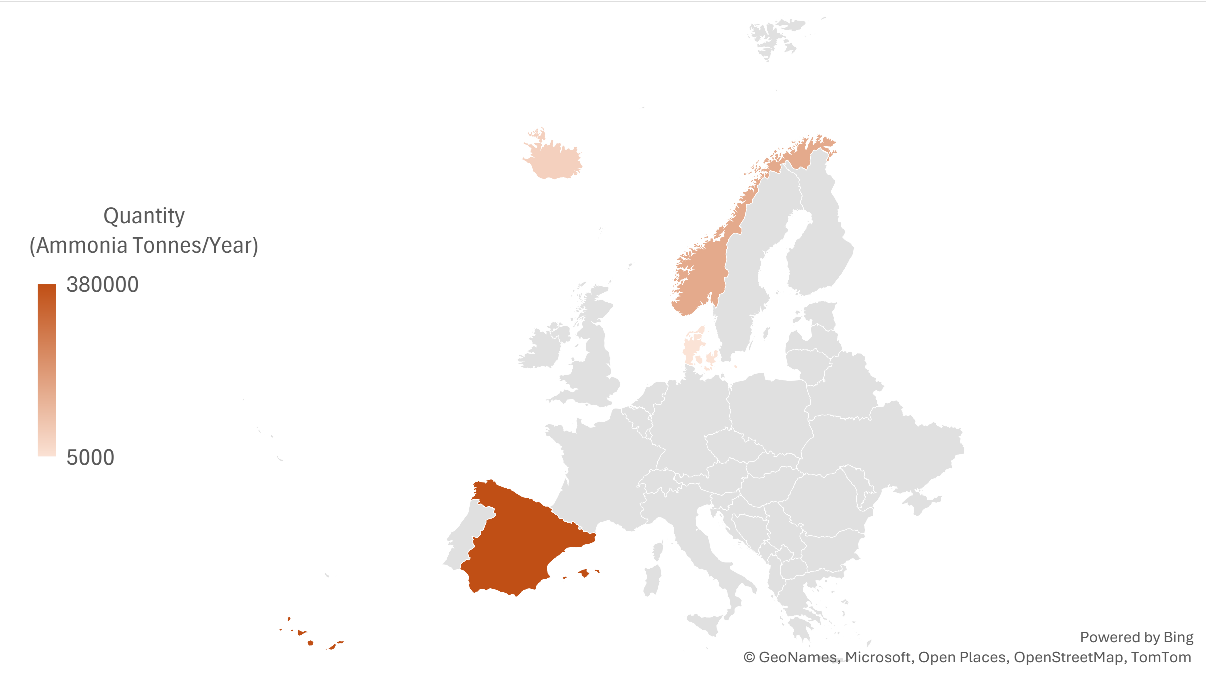

[15] Data from 2nd EBA Investment Outlook on Biomethane (June 2024)
[16] Data from Annex 1 of the EBA paper on Mapping e-methane plants and technologies (September 2024)

***Renewable ammonia***

By 2030, according to the DNV Alternative Fuel Insight,[17] with current operating and in-construction projects, Europe has a potential to produce 587,220 tonnes of low carbon Ammonia (NH3) per year or equivalent to 0.26 Mtoe[18] (see Figure 7). This estimate is conservative as it does not take into account the projects that are in discussion.

Under current order book projections, global fleets are estimated to require approximately 0.7 Mtoe of maritime ammonia. Consequently, European renewable ammonia production is projected to cover 37% of global maritime demand. Ammonia for maritime fuel applications will have to compete with other sectors, including fertilisers, chemicals, refrigerants, and pharmaceuticals, that are also pursuing its use. Moreover, there is limited recent experience in the marine sector using ammonia as a fuel, and several key machinery technologies, such as engine designs, are still under development.

**Figure 7: 2030 EEA potential low carbon ammonia production[19]**

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**Performance potential for 2030 renewable marine fuels to meet 2050 targets**

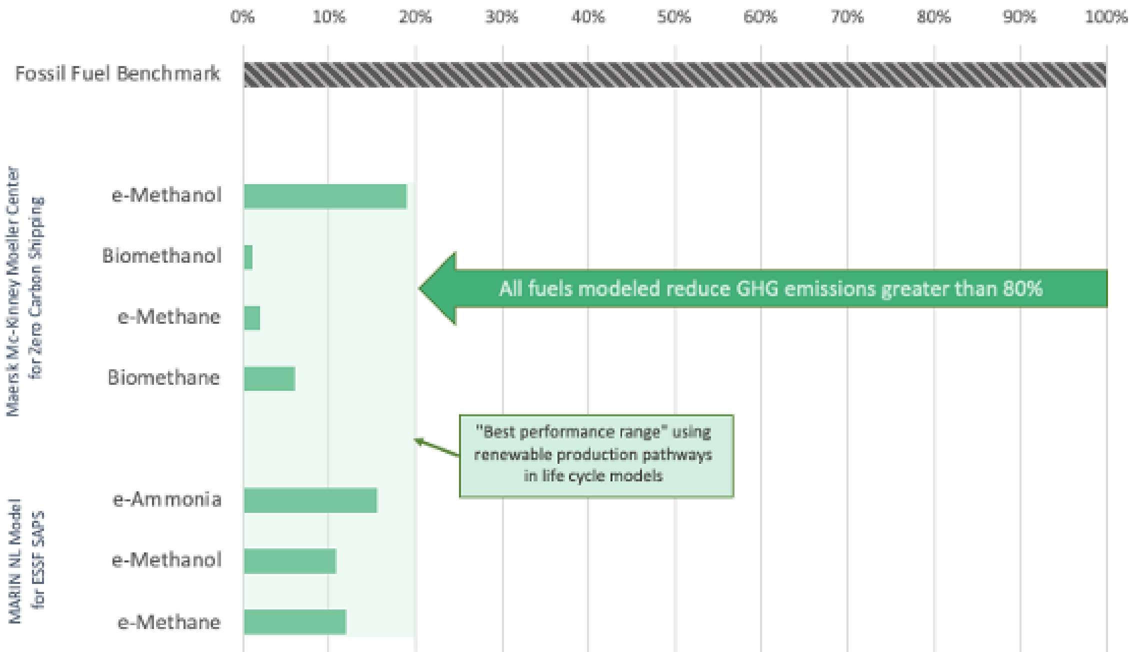
While additional renewable marine fuel pathways and new zero-GHG technologies may emerge over the next decades, the renewable marine fuels mentioned in this section, provide a strong start to the transition and deliver lifecycle GHG reductions as soon as 2030.

[17] DNV Alternative Fuel Insights tracks ammonia fuel production projects, with focus on e-fuels and blue fuels. Accessed on March 2025 at https://afi.dnv.com/.
[18] Using the LHV of 18.6 MJ/kg for ammonia
[19] DNV Alternative Fuel Insights

The 2023 IMO Strategy states that 'the levels of ambition and indicative checkpoints should consider the well-to-wake GHG emissions of marine fuels. Figure 8 compares the lifecycle GHG performance of various renewable fuel pathways against fossil fuels, drawing from the MARIN portal for the European Sustainable Shipping Forum (ESSF) and the Industry Transition Strategy by the Maersk McKinney Møller Center for Zero Carbon Shipping. The results consistently show that all modelled fuels reduce GHG emissions by over 80%.

Additionally, over the next two decades, renewable methane, renewable methanol, and renewable ammonia will be produced with fully renewable electricity and benefit from expected innovation in production processes. In other words, renewable fuel pathways that could be available by 2030 will also be among the multiple decarbonisation pathways needed for 2050.

**Figure 8: Multiple pathways for renewable marine fuels can meet 2050 GHG target**[20]




[20] Figure adapted from ISWG-GHG 13/3/9, "Understanding 'net-zero', 'near-zero', 'absolute zero', and 'zero', Submitted by WSC, October 2022; available at this WSC website link.

# Global renewable fuel supply could meet demand by 2030

Fuel supply could scale by 2030; however, without a GHG price on fossil fuels, these fuels will not be commercially viable.

**Global projected renewable fuel supply in 2030**

Beyond the European borders, estimates by GENA Solutions indicate conservative and optimistic projections for the global supply of renewable marine fuels in 2030. Table 7 and Figure 9 present these projections.

**Table 7: Renewable fuel supply projections (Mtoe)[21]**

| Example scenarios | Estimated ZNZ (e-fuel) supply | | | Estimated Biofuel supply | | |
|---|---|---|---|---|---|---|
| | Methane | Methanol | Ammonia | Methane | Methanol | Ammonia |
| Conservative | 0.26 | 0.44 | 2.3 | 7.2 | 1.2 | |
| Optimistic | | 2.9 | 12.6 | 22.1 | 3.5 | |

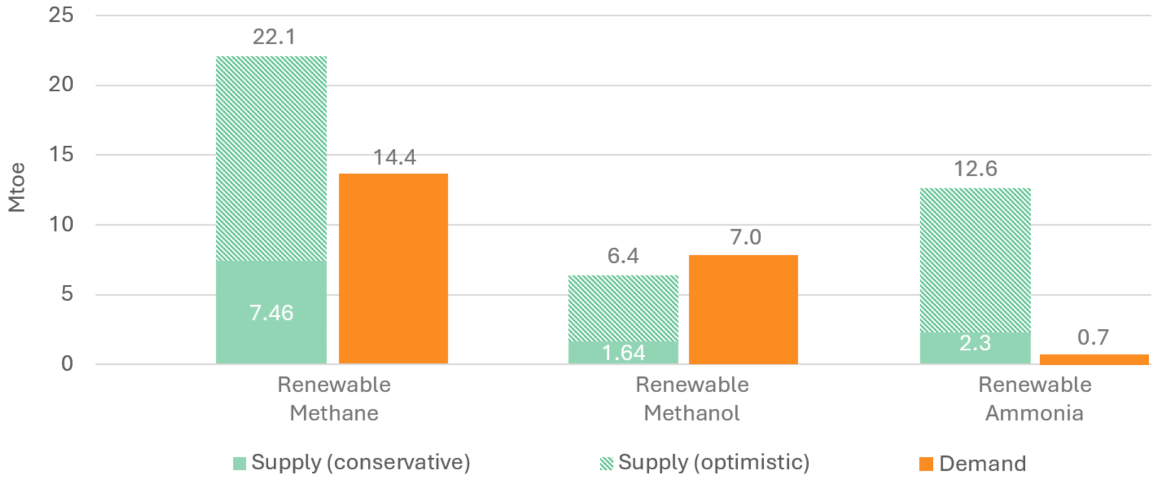
**Global renewable fuel supply could meet demand by 2030**

Renewable fuel production scenarios indicate potential to meet at least some projected renewable marine fuel demand. However, production capacity will only translate to actual production with conditions for commercial uptake. Moreover, going beyond conservative scenarios requires an effective regulatory measure to stimulate a commercially viable demand market, and in turn production of adequate supply.

Optimistic estimates also draw on plans for future investment which will be dictated by regulatory measures ensuring there is a market for those fuels.

[21] Estimates for methanol and ammonia based on analysis and insights shared by GENA Solutions, March 2025. Estimates for renewable methane rely on information from SEA-LNG reports and website, accessed March 2025.

**Figure 9: Global renewable fuel supply ranges compared with fleet demand by 2030**




In Europe, the projected production of these fuels indicates that the region could meet 22% of global renewable methanol demand and 9.5% of global renewable methane demand. If all renewable ammonia production were allocated to marine fuel—though unlikely—Europe could cover 37% of global demand. For context, the EU currently supplies 20% of the world's conventional marine fuel.

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**Bio-fuels alone can't scale to meet long-term demand**

Biofuels provide a renewable energy source but face scalability challenges that limit their long-term role in shipping. While projected renewable fuel supply in 2030 may align with demand, much of it relies on biofuels. However, the *Report of the Comprehensive Impact Assessment of Candidate GHG Reduction Mid-Term Measures*[22] identifies supply constraints on bio- and blue fuel feedstocks that do not apply to e-fuels or carbon storage capacity. Additionally, competing demand from other sectors may make e-fuels critical for meeting decarbonisation targets.

For example, the European Biogas Association estimates that by 2030, Europe will produce 6.3 billion cubic meters of biomethane annually (5.67 Mtoe). Even if all transport-designated biomethane were allocated to shipping, only 9.4% of the projected 14.4 Mtoe global maritime methane demand would be covered. Land use restrictions, deforestation concerns, and food security further limit large-scale biofuel expansion.

Given these constraints, biofuels alone cannot meet shipping's full decarbonisation needs. This highlights the critical role of e-fuels—such as e-methane, e-methanol, and e-ammonia—which can be produced at scale using renewable electricity and carbon capture. Unlike biofuels, e-fuels offer a viable long-term pathway for deep decarbonisation. A key constraint to e-fuel production is its higher cost compared to fossil fuel-based alternatives; scaling up production and utilisation could help reduce these costs, but bridging the cost will require effective regulation.

[22] Source: MEPC 82/INF.8/Add.1, IMO Secretariat, Report of the Comprehensive impact assessment of the basket of candidate GHG reduction mid-term measures – full report on Task 2 (Impacts on the fleet).

**Investments favour continued reliance on fossil fuels**

Despite growing momentum for shipping decarbonisation, some recently announced investment decisions by major fuel companies continue to favour fossil fuels. The absence of a global GHG regulation, along with broader geopolitical energy concerns, may be driving major energy producers to prioritise fossil fuel production rather than accelerate the transition to renewable alternatives.

- **Shell LNG outlook 2025**[23] predicts that over 170 million tonnes of new fossil LNG supply will come online by 2030 to meet rising global demand. This report signals continued investment in fossil-based liquefied natural gas, which, while a lower-carbon alternative, still contributes to greenhouse gas emissions.
- **BP's shift away from renewables**[24]: BP recently announced a pivot away from renewable energy investments, choosing instead to expand oil and gas production. While BP has stated its commitment to reducing the carbon intensity of its energy products to net zero by 2050 or sooner, it acknowledges that achieving this goal depends on supportive government policies and decarbonisation efforts across energy demand sectors.

These examples highlight the challenges of securing large-scale investment in alternative marine fuels. Without clearer regulatory frameworks and stronger market incentives, some energy producers may continue prioritising short-term returns from fossil fuels over long-term sustainability.

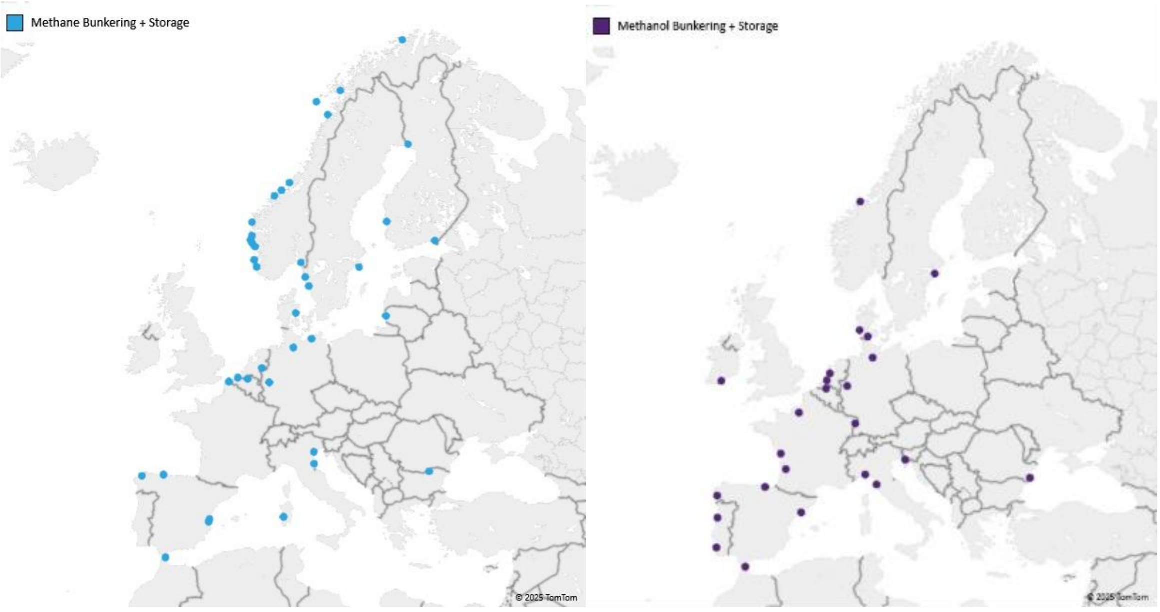
[23] Shell LNG Outlook 2025 (February 2025), accessed March 2025
[24] Reuters, "Exclusive: BP abandons goal to cut oil output, resets strategy" (October 2024), accessed March 2025

## Bunkering infrastructure in the EU

In the EEA region, bunkering and storage facilities that could be used for renewable methanol and methane reportedly already exist at numerous ports along the European coast, as indicated by the IMO Future Fuels and Technology Project Fuel Supply Chart.

As illustrated in Figure 10, Europe has 39 out of the 88 global combined methane bunkering and storage facilities and 24 of the 116 methanol combined bunkering and storage facilities. This suggests that the initial investments exist in key European maritime hubs. For example, the Port of Rotterdam alone delivered nearly 4,000 tonnes of bio-methanol as marine fuel in 2024, an increase from just 750 tonnes in 2023.[25]

**Figure 10: Methane and methanol EEA bunkering infrastructure[26]**




Nevertheless, current data are insufficient to determine whether these facilities have the capacity and infrastructure required to meet projected demand by 2030, or if they will receive an adequate volume of alternative fuels from production sites. As such, additional research and data will be necessary to clarify if existing bunkering and storage operations could meet future demand or, conversely, become a bottleneck.

[25] Bunker Sales Port of Rotterdam 2021-2024, accessed March 2025.
[26] Source: IMO Future Fuels and Technology Project Fuel Supply Chart, accessed March 2025.

# Regulatory measures are necessary

For renewable marine fuels to be widely adopted, they must be commercially viable and have sufficient supply. Since market forces alone will not drive the switch to cleaner fuels, regulations play a key role.

As fossil fuels are cheaper than renewable alternatives, effective regulations can bridge the gap. They can encourage investment in renewable energy, set clear fuel and emissions standards, and offer incentives to speed up adoption, working together to meet climate targets by 2050.

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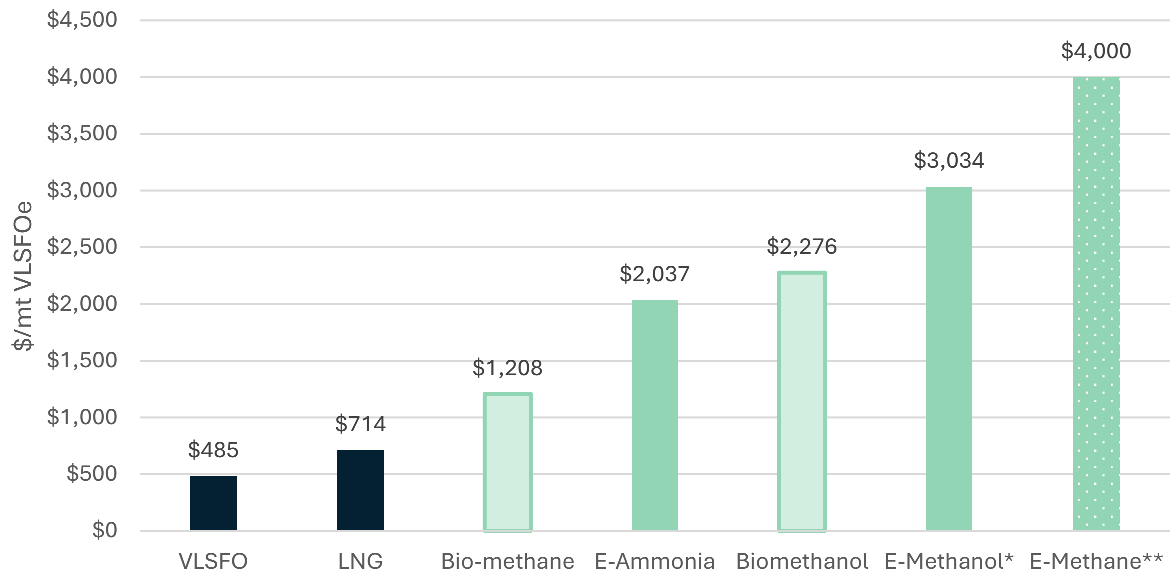
**Price gap remains critical barrier**

A review of pricing reports on conventional and renewable marine fuels makes clear that the economic conditions do not support their commercial use. Recall that the renewable marine fuels that could be available by 2030 provide lifecycle GHG reductions aligned with 2050 targets (see Figure 9). Figure 11 shows that renewable marine fuels needed for Europe to meet EU Green Deal legislative targets cost much more than conventional fossil fuels.

**Figure 11. Representative marine fuel pricing in Europe[27]**




Current market data and projections indicate that bio-methane is estimated to be 169% more expensive than its fossil fuel equivalent, LNG, while bio-methanol is approximately 469% more expensive than Very Low Sulphur Fuel Oil (VLSFO). Among e-fuels, only e-ammonia is currently available in the European bunkering market and is priced about 285% higher than LNG. In contrast, price projections for e-methanol and e-methane—which are not yet traded in the European bunkering market—indicate that they would be approximately 626% and 560% more expensive than VLSFO and LNG, respectively.

[27] Platts Global Bunker Fuel Cost Cast Calculator & DNV Alternative Fuel Insights – February 2025
* E-Methanol price projected using SAFE-T (EERA)
** E-Methane price projected using average prices from various sources

These cost differentials suggest that, at current market rates, renewable marine fuels are not yet commercially viable. Targeted GHG pricing proportional to well-to-wake GHG performance would enable the best pathways for meeting 2050 decarbonisation goals.

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**Regulation is needed to bridge the price gap**

All maritime decarbonisation policy studies conclude that global policy designs are the best and most effective mechanism to reduce GHGs from international shipping. Global GHG policies reduce market distortions, ensure fair competition, and drive a broader shift to renewable fuels, benefitting all economies while mitigating climate change.

The EU's leadership is crucial in shaping ambitious global regulations. European Member States and the European Union are among the 176 member states engaged at the International Maritime Organisation, working to establish a global GHG fuel standard and GHG pricing mechanisms, frequently referred to as the 'IMO Net-Zero Framework.'

Recognising that ambitions for decarbonisation vary across diverse regions and among nations, regional policy action can sometimes be coordinated more quickly. This is the case of the European Union, which launched in 2019 a package of policy initiatives, which set the EU on the path to a green transition, with the ultimate goal of reaching climate neutrality by 2050.

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**Current EU regulations and global negotiations leadership at IMO**

Concurrent with their engagement at IMO during development of the IMO Net Zero Framework, the European Union initiated the EU Green Deal. For the maritime sector, Europe put in place a detailed comprehensive framework to decarbonise shipping, reduce shipping emissions and promote renewable marine fuels. Key policies, such as the Renewable Energy Directive (RED III), FuelEU Maritime, the EU Emissions Trading System (EU ETS), and the Alternative Fuels Infrastructure Regulation (AFIR), lay the groundwork for this transition.

Europe's design of the EU Green Deal to include the maritime sector included some, but not all, of the same principles proposed by European Member State delegations to the IMO. For example, both the EU Green Deal and EU proposal to IMO fully support setting a GHG fuel standard using a lifecycle (well-to-wake) approach. However, the EU has so far taken two different approaches to GHG pricing.

The EU proposals at IMO for GHG pricing propose a price per tonne CO2-equivalent, based on accurate well-to-wake GHG emissions accounting inclusive all long-lived GHGs using the approach defined by the UNFCCC. Regionally, EU ETS does not yet apply lifecycle GHG pricing to the maritime sector. Instead, EU ETS currently applies a tank-to-wake pricing approach, which cannot reflect the actual GHG performance of renewable marine fuels. Diverging from the lifecycle performance-based approach in FuelEU Maritime, tank-to-wake GHG pricing in the EU ETS works as a price barrier for maritime sector transition to renewable fuels.

***FuelEU maritime and renewable marine fuels***

FuelEU Maritime introduces a performance-based regulatory framework for alternative fuel adoption, ensuring technological neutrality while setting feasible uptake targets. Alongside the

EU ETS, it applies to approximately 67% of fuel consumption reported under the EU Monitoring, Reporting, and Verification (MRV) system—around 41 million tonnes of oil equivalent in 2023. By covering emissions from extra-EU voyages, the regulation captures a significant share of maritime fuel use, reinforcing the EU's commitment to reducing emissions.

FuelEU Maritime mandates a phased reduction in GHG intensity, aligning with EU climate objectives and requiring a shift to zero- and near-zero (ZNZ) emission fuels. Based on 2023 EU MRV reporting, an example calculation of the fuel quantities that would switch to renewable marine fuels under FuelEU Maritime can be illustrated in Table 8.

**Table 8: FuelEU transition requirements illustrated using recent EU MRV reporting[28]**

| Period | FuelEU GHG % Reduction | Fuel Quantities to Switch (Mtoe) |
|---|---|---|
| 2025-2029 | 2.0% | 0.63 |
| 2030-2034 | 6.0% | 1.89 |
| 2035-2039 | 14.5% | 4.56 |
| 2040-2044 | 31.0% | 9.74 |
| 2045-2050 | 62.0% | 19.48 |
| 2050- | 80.0% | 25.14 |

*Note: Estimated fuel quantities are based on current EU MRV fuel consumption and do not consider fuel consumption changes from growth or decline in trade or future geopolitical or commercial conditions.*

Moreover, supply estimates in Table 7 also indicate that the renewable energy value chain, on a global level, could provide sufficient renewable marine fuels to meet FuelEU Maritime reduction requirements for 2025-2029 and 2030-2034.

***EU ETS and GHG pricing policies***

The EU Emissions Trading System (EU ETS) establishes a cap on greenhouse gas emissions and generates revenue through trading of emission allowances. GHG emissions limits set by the cap are lowered each year to drive all included sectors to EU-wide GHG milestones and promote competitive innovation for the most economically efficient GHG reductions across sectors.

For the maritime sector, the EU ETS is applied exclusively to the tank-to-wake phase—addressing emissions that result from fuel consumption during vessel operation—while leaving unpriced emissions associated with the upstream production and supply of fuels. Where EU energy production and supply is priced in EU ETS, upstream ETS complements GHG pricing on consumption of fuels in non-maritime EU sectors and approximates a well-to-wake GHG price. Since EU does not produce more than 20% of global marine fuels, EU ETS cannot provide GHG pricing aligned with the lifecycle performance-based requirements in FuelEU Maritime.

The EU ETS framework applied to the maritime sector sets a GHG price on continued use of fossil fuels. However, ETS currently does not incorporate a cost-for-difference mechanism for early uptake of renewable marine fuels. Unlike the EU proposal to IMO that proposes a cost-for-difference mechanism to ensure commercial uptake of so-called "zero and near-zero fuels (ZNZs). Proposals considered at IMO would direct revenues from GHG pricing on fossil fuels to bridge the cost gap illustrated in Figure 11.

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[28] 2024 Report from the European Commission on CO 2 Emissions from Maritime Transport, Full Report, SWD(2025) 38 final, European Commission, December 2024.

*Alternative fuels infrastructure regulation (AFIR)*

AFIR establishes a framework for integrating renewable energy sources into the EU's Trans-European Transport Network (TEN-T) and strengthening links with the Trans-European Energy Network (TEN-E). Ensuring sufficient alternative fuel infrastructure is critical for the maritime sector's transition to sustainability.


**Regulatory challenges and areas for improvement**

***1. EU policy should align with global regulations***

To ensure a competitive and sustainable transition, the European Union's maritime decarbonisation policies must align with global efforts under the International Maritime Organisation (IMO). While the EU can, and should, set ambitious targets, these initiatives must remain consistent with broader international frameworks to avoid creating regulatory fragmentation and to promote effective, worldwide emission reductions.

***2. Well to Wake is a key principle to ensure that renewable fuels are rewarded***

A well-to-wake perspective evaluates emissions across the entire lifecycle of a fuel, from production to onboard combustion. Adopting this comprehensive view is essential to accurately capture the full climate impact of different fuel pathways and to ensure that truly low-carbon or renewable fuels are recognised and incentivised. Focusing only on tank-to-wake, by contrast, risks overlooking significant upstream emissions.

Fossil fuels are rewarded on a tank-to-wake basis, and we need renewable fuels to be rewarded (reduced exposure to EU ETS). This can only happen on a lifecycle or well-to-wake basis.

### *3. A true cost for difference mechanism is the catalyst for renewable marine fuel uptake*

While the EU ETS currently places a price on carbon emissions in maritime operations, GHG pricing on fossil fuels fails to address higher production costs associated with renewable and low-carbon fuels. A cost-for-difference mechanism — possibly funded by ETS revenues — could help bridge this gap and make these alternative fuels more commercially viable.

Based on the prices in Figure 11, the cost of meeting FuelEU Maritime before 2030 (2% reduction in GHG=intensity) could equal between 6% and 20% of maritime EU allowances (EUA) revenue in 2026 at 90 Euro price; the cost of meeting 2030 requirements for 6% reduction in GHG-intensity could range between 17% and 60% of maritime EUA revenue. EU ETS revenues from maritime sector purchase of EUAs provides more than enough resource for considering cost-for-difference as a remedy for market price barriers to uptake and production of renewable marine fuels. Policy action can then ensure the markets transitioning to renewable marine fuel emerge and accelerate to scale.

### *4. Fuel certification systems ensure global supply of truly renewable marine fuels*

As shipping becomes increasingly reliant on alternative fuels, establishing robust certification standards is paramount. Certification systems must verify not only a fuel's carbon intensity but also its sustainability credentials and origin. A harmonised framework would allow shipowners and operators to demonstrate compliance with EU (and potentially IMO) rules regardless of where they bunker, thereby promoting global uptake of genuinely low-emission fuels.

# Conclusion

The transition to renewable marine fuels is essential for the shipping industry to meet the EU's climate targets and achieve net-zero emissions by 2050. This report highlights the critical need for scalable and commercially viable alternatives to conventional fossil fuels. The development of new renewable-fuel capable vessels, coupled with sufficient supply of renewable fuels, is crucial to ensure the industry's successful decarbonisation.

While Europe is poised to play a significant role in renewable fuel supply, meeting the projected demand by 2030 will require effective regulatory measures and financial mechanisms to bridge the cost gap between fossil and renewable fuels. The EU's leadership in shaping global regulations and aligning regional policies with international frameworks will be key to driving the adoption of cleaner shipping fuels and promoting a sustainable maritime future.

The EU has an opportunity through the green transition to become a leader in the competitive production and supply of renewable fuels. By aligning EU policy with global measures, and ensuring that current policies adopt a true cost to difference mechanism, the EU can help drive shipping decarbonisation within its borders, but also globally.

Prioritising effective decarbonisation is not only good environmental policy for 2050. Prioritising decarbonisation for Europe's shipping links to global trade is critical to remaining competitive in the global economy.

Prescribed legislative reviews of FuelEU Maritime and EU ETS call for alignment with IMO GHG measures that will be finalized in fall of 2025. This means the Commission may propose revisions that reinforce lifecycle and performance-based standards while reassessing the extra-EU scope to mitigate competitive disadvantages. Strengthening international collaboration will be key to maintaining the EU's leadership in maritime decarbonisation efforts.

The shipping industry' commitment to decarbonisation is clear and early transition progress is visible, particularly when you look at the order book for new, renewable-capable, liner vessels. The World Shipping Council supports a global measure to bridge the existing price gap that currently means renewable fuels are not commercially viable. WSC continues to support well-to-wake performance-based fuel standards that are pathway inclusive, within the EU Green Deal and in the current negotiations for IMO mid-term measures.

With over 1,000 renewable-capable vessels to be delivered by 2030, together, the shipping industry, fuel producers and regulators have the power to decarbonise shipping. The leadership role the EU has taken on the green transition puts it in a ready position to build supply and create the right conditions for demand. With effective action on four top-level recommendations, the EU can help shipping meet decarbonisation goals while ensuring a competitive and sustainable transition of European energy production, supply, and port infrastructure.

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